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ABSTRACT

This monography presents the concepts to be presented, the psychomotor skills through to pertain to all the concepts, the process skills required, and the values and attitudes hoped to be developed for a science curriculum, K through 8. A list of suggested field trips accompanies each syllabus. At the kindergarten through grade 6 levels, scientific concepts are presented concerning Animal and Plant Biology, Health and Nutrition, Earth and Space Science, Matter and Energy, as well as some general concepts of Measurements. A more detailed course outline is presented for levels seven and eight. In level seven, greater emphasis is placed on such concepts as Evolution, Genetics and Interdependency, in the biological sciences and Forms of Energy, and Simple Mechanics for the physical sciences. Attention is given to careers in science, great names in science and the measurement system in both levels seven and eight. The psychomotor skills, process skills and affective skills suggested are also directed toward both levels. Earth and Space science, including Oceanography, is developed as level eight. (JB)

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SEAFORD SCHOOL DISTRICT
SCIENCE GUIDE

By

Science Department
SEAFORD SCHOOL DISTRICT

Printed and disseminated through the office of the Del Mod Component Coordinator for the State Department of Public Instruction, John G. Townsend Building, Dover, Delaware 19901

SE 018 008

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KINDERGARTEN

I. ANIMAL KINGDOM

1. Animals are different
   (1. birds, 2. fish,
   3. butterflies, 4. dogs,
   5. turtles, 6. frogs,
   7. farm animals).

2. Animals live in different places.

3. Animals make different sounds.

4. Seasonal changes influence the behavior of some animals.

5. Animals benefit man.

II. PLANT KINGDOM

1. Plants differ in color, size, parts, and use.

2. The structure of a plant consists of stem, root, leaves, flower, etc.

3. There are common types of fr[illegible] and vegetables.

4. Plants differ from animals.

III. DRUGS

1. Medicines (drugs) are designed to cure and prevent illness but can be dangerous when improperly used or taken.

2. Hazards are posed by abuse of non-medical substances such as glues, gasoline, household products.

IV. HEALTH AND NUTRITION

1. The body has basic parts--head, hands, etc.

2. Personal and dental hygiene is important.

3. Good nutritional habits are important.

4. There are many local sources of pollution which are hazardous to our health.

5. Man depends on the food chain.

6. Essential nutrients (such as vitamins, minerals, fats, carbohydrates, proteins, etc.) are important to our health.

7. The body is organized into systems, organs, tissues, and cells.

V. EARTH AND SPACE

1. Seasonal change has effect on man (clothing and activities).

2. The members of the universe are sun, moon, earth, stars).

3. Daily weather changes take place constantly.

VI. MATTER AND ENERGY

1. Sounds and their sources vary.

2. Some things are attracted to a magnet and some are not.

K - 6

GENERAL

1. A point or line graph tells date.

2. The metric system is a form of measuring.

3. Objects can be ordered according to shapes, colors, size, volume, and number.

4. The terms "up", "down", "over", "under", "left", "right", "forward", "backward" can be used to locate objects.

5. There are the five senses.

6. Time is measured in various ways.

7. A simple balance can help ordering objects by weight.

8. There are differences between observations and inferences (comparing what you see to what you have guessed).

PSYCHOMOTOR SKILLS

*1. Proper coordination of the senses in reaching for, grasping, holding, and releasing objects.

2. Use and awareness of five basic senses.

3. Use of linear measurement devices.

4. Use of weighing devices.

5. Proper use of weather instruments.

6. Proper use of scientific models.

7. Proper use of audio-visual equipment.

8. Proper care and use of magnets.

9. Proper use of aquarium, terrarium apparatus.

10. Proper use of graphing materials.

11. Proper use of tools for "specific task" (example: hammer, screwdriver)

12. Proper use of simple and complex machines.

13. Proper handling of preserved specimens.

*14. Proper methods of seed planting.

15. Proper cleanup activities.

16. Proper use of microscope and telescope.

17. Use of thermometer.

18. Proper handling of living organisms.

19. Proper use of electrical equipment.

20. Proper use of indicators.

*21. Proper use of laboratory safety devices.

*22. Proper use of simple laboratory equipment.

*These skills are thought to pertain to all concepts.

PROCESS SKILLS

1. OBSERVING

2. MEASURING (to include usage in both metric and English)

   Sequence
   (a) Time
   (b) Length
   (c) Temperature
   (d) Mass
   (e) Volume
   (f) Force
   (g) Estimating

3. DEFINING

4. VARIABLES

   (a) Definitions of controlled, responding, manipulative
   (b) Use of the above variables
   (c) Recognising

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Predicting
   (b) Interpreting
   (c) Generalising
   (d) Graphing and table construction

9. IDENTIFYING

10. TESTING

VALUES & ATTITUDES TO BE DEVELOPED

1. Awareness
2. Respect and care for animals
3. Respect for one's self
4. Questioning of all science happenings
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Consideration of consequences
10. Proper care and respect for human body
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Consideration and respect for all learning materials
14. Demand for verification
15. Respect for logical conclusions
16. Makes a distinction between scientific evidence and personal opinion
17. Appreciation of scientific work being carried out by others
18. Respect for electricity
19. Appreciation of past accomplishments of science and famous scientists
20. Appreciation for drugs
21. Recognising the limitations as well as the usefulness of science and technology in making the world a better place to live
22. To recognise a need for self-control and self-discipline in scientific endeavors

FIELD TRIPS - X

Craig's Pond

Turkey Farm

Apple Orchard

Georgetown, University of Delaware Experimental Station

Walks Around School

Supermarket

LEVEL 1

I. ANIMAL KINGDOM

1. All things are living or non-living.

2. Plants are different from animals.

3. Animals have differences and likenesses.

4. Animals belong in categories (such as locomotion, body coverings, resemblance to parents, type of home and/or securing foods, etc.)

5. Some animals can be seen in different environments (zoo, city, farm, pond).

6. Animals have basic needs.

II. PLANT KINGDOM

1. All things are living or non-living things.

2. Plants differ from animals.

3. Plants differ from each other--trees, shrubs, etc.

4. Trees are identified as deciduous or coniferous.

5. Leaves differ in size, color and shape.

6. Seeds are dispersed in different ways.

7. Plants have basic needs.

III. DRUGS

1. Medicines (drugs) are designed to cure and prevent illness but can be dangerous when improperly used or taken.

2. Hazards are posed by abuse of non-medical substances such as glues, gasoline, household products.

IV. HEALTH AND NUTRITION

1. The body has basic parts--head, hands, etc.-
2. Personal and dental hygiene is important.
3. Good nutritional habits are important.
4. There are many local sources of pollution which are hazardous to our health.
5. Man depends on the food chain.
6. Essential nutrients (such as vitamins, minerals, fats, carbohydrates, proteins, etc.) are important to our health.
7. The body is organized into systems, organs, tissues, and cells.

V. EARTH AND SPACE

1. Seasonal change has its effect on man (clothing and activities).

2. Shadows are formed and can be changed.

3. Earth is man's home.

4. Temperature can be observed, measured, and recorded.

VI. MATTER AND ENERGY

1. Sounds and their sources vary.

2. There are different sources of light and light has many uses.

3. Three states of matter are solids, liquid and gases.

4. Some objects float and some sink.

5. Energy comes from a variety of sources (spring type rubber bands, manual toys).

6. There are many uses of the wheel.

7. Objects vary in temperature.

8. Heat has many uses.

9. The poles of a magnet attract and repel.

10. A magnet is used in everyday life.

K - 6

GENERAL

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7. Proper use of audio-visual equipment.

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16. Proper use of microscope and telescope.

17. Use of thermometer.

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   (d) Mass
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   (g) Estimating

3. DEFINING

4. VARIABLES

   (a) Definitions of controlled, responding, manipulative
   (b) Use of the above variables
   (c) Recognizing

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Predicting
   (b) Interpreting
   (c) Generalizing
   (d) Graphing and table construction

9. IDENTIFYING

10. TESTING

VALUES & ATTITUDES TO BE DEVELOPED

1. Awareness
2. Respect and care for animals
3. Respect for one's self
4. Questioning of all science happenings
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Consideration of consequences
10. Proper care and respect for human body
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Consideration and respect for all learning materials
14. Demand for verification
15. Respect for logical conclusions
16. Makes a distinction between scientific evidence and personal opinion
17. Appreciation of scientific work being carried out by others
18. Respect for electricity
19. Appreciation of past accomplishments of science and famous scientists
20. Appreciation for drugs
21. Recognising the limitations as well as the usefulness of science and technology in making the world a better place to live
22. To recognise a need for self-control and self-discipline in scientific endeavors

FIELD TRIPS - LEVEL 1

Salisbury Zoo

Greenhouse

School Yard

Penn Central Station

LEVEL 2

I. ANIMAL KINGDOM

1. The six groups in the animal kingdom depend on their basic needs.

2. Animals adapt to their environment.

II. PLANT KINGDOM

1. Seed dispersal varies according to type of plant.

2. Plants have basic needs.

3. Plants are started either by seed, bulb, or cuttings.

III. HEALTH AND NUTRITION

1. The body has basic parts--head, hands, etc.

2. Personal and dental hygiene is important.

3. Good nutritional habits are important.

4. There are many local sources of pollution which are hazardous to our health.

5. Man depends on the food chain.

6. Essential nutrients such as vitamins, minerals, fats, carbohydrates, proteins, etc., are important to our health.

7. The body is organized into systems, cells, tissues, and organs.

IV. DRUGS

1. Medicines (drugs) are designed to cure and prevent illness, but can be dangerous when improperly used or taken.

2. Hazards are posed by abuse of non-medical substances such as glues, gasoline, household products.

V. EARTH AND SPACE

1. There are major features of the earth's surface.

2. A map or globe can be used to identify directions (N.S.W.E.)

3. There are several different types of weather.

4. There is a relationship between fog, clouds, and rain (precipitation).

5. There are various types of soil such as rocky, sandy, clay, etc.

VI. MATTER AND ENERGY

1. Heat is a form of energy that changes solid to liquid.
2. A standard thermometer measures different temperatures.
3. Some objects and liquids float on water; others will not.
4. Sound is a form of energy.
5. Sun is basic source of energy.
6. Newton's Law describes energy, push-pull, and friction.
7. There are six simple machines.
8. Electricity is a form of energy.
9. Man uses electricity in many ways.
10. Precautions must be followed when using electricity.
11. There are systems that use electrical energy to make light and sound.

GENERAL

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   (a) Grouping
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8. ORGANIZING DATA

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FIELD TRIP - LEVEL 2

Country Club - Duck Pond

Veterinarian's Office

Washington Zoo

School Yard

II. PLANT KINGDOM

1. Animals and plants are dependent upon each other.

2. Mold has economic importance to man.

3. Plants can reproduce by cuttings, tubers, and bulbs.

4. Conservation laws teach wise use of plants.

III. HEALTH AND NUTRITION

1. The body has basic parts--
   head, hands, etc.

2. Personal and dental hygiene
   is important.

3. Good nutritional habits are
   important.

4. There are many local sources of
   pollution which are hazardous to
   our health.

5. Man depends on the food chain.

6. Essential nutrients (such as vitamins,
   minerals, fats, carbohydrates, proteins,
   etc.) are important to our health.

7. The body is organized into systems, organs,
   cells, and tissues.

IV. DRUGS

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2. Hazards are posed by abuse of non-medical substances such as glues, gasoline, household products.

V. EARTH AND SPACE

1. Plants, animals, wind, and water have an effect on soil.
2. Decomposition aides the soil.
3. Stones, shells, and fossils have their own characteristics.
4. The solar system consists of the planets, sun, stars, and moon.
5. Revolution and rotation are two types of movement of the earth.
6. Constellations are a group of stars.
7. Earth's inclination causes the seasons.
8. Weather conditions affect man.
9. Gravity is the pull of the earth.
10. The three states of matter are solids, liquids, and gases.

VI. MATTER AND ENERGY

1. Energy can be stored (spring and rubber band).
2. There are six simple machines.
3. There are physical and chemical reactions which present a series of changes of matter in water.
4. Sound varies.
5. Wind and water are forms of energy.
6. A compass is used to find direction.
7. Electromagnets can be made from every-day materials.
8. The strength of an electromagnet can be determined.

K - 6

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FIELD TRIPS - LEVEL 3

Beach

Wood Area

Orchard

Dentist Visit

Dover Planetarium

Pepsi Cola or Coca Cola (Salisbury, Maryland)

Diamond State Telephone (Georgetown)

LEVEL 4

I. ANIMAL KINGDOM

1. Animals are vertibrates and invertibrates.

2. Locomotion of animals differ.

3. Animals are carnivorous, herbevorous or omorivorious.

4. Insects have main characteristics (life cycle).

5. Animals have different methods of reproduction.

6. Some animals migrate and/or hibernate.

7. There are wise and unwise uses of animal life.

8. The cell is the basic structure of all living things.

9. There are structural units of living organisms (cell, tissue, organ, system, organisms).

10. In nature there are simple food chains.

11. The human body has many functions.

II. PLANT KINGDOM

1. Plants react to seasonal changes.

2. Plants react to light, water, and air.

3. Plants live in a variety of environments.

4. There is an interdependence between plants, animals, and environment.

5. Plants have an importance on everyday life (food, clothing, medicine, shelter).

III. HEALTH AND NUTRITION

1. The body is organized into systems, organs, tissues, and cells.

2. The body has basic parts -- head, hands, etc.

3. Personal and dental hygiene is important.

4. Good nutritional habits are important.

5. There are many local sources of pollution which are hazardous to our health.

6. Man depends on food chain.

7. Essential nutrients such as vitamins, minerals, fats, carbohydrates, proteins, etc., are important to our health.

IV. DRUGS

1. Medicines (drugs) are designed to cure and prevent illness, but can be dangerous when improperly used or taken.

2. Hazards are posed by abuse of non-medical substances such as glues, gasoline, household products.

V. EARTH AND SPACE

1. Weather conditions affect man.
2. Gravity is the pull of the earth.
3. The three states of matter are solids, liquids, gases.
4. The three states of matter undergo chemical and physical changes.
5. The surface of the earth is constantly changing.
6. Conservation of the earth is important.
7. Various members of the solar system and the sun affect the earth.
8. There are several major constellations.
9. The earth is in the Milky Way Galaxy.
10. Two types of thermometers are Farenheit and Celsius.
11. A temperature graph shows change.
12. Precipitation comes in many forms (evaporation, saturation, condensation, and humidity).
13. The world has many climates.
14. A meterologist compiles weather information.

VI. ELECTRICITY

1. Electric charges and ways of producing an electric current vary.

2. There are positive and negative charges of electricity.

3. Benjamin Franklin made contributions in the field of electricity.

4. There are many advantages and disadvantages of electricity.

VII. SIMPLE MACHINES

1. Friction is a force that helps or hinders.

2. Objects that rest tend to remain at rest; objects in motion tend to remain in the same state of motion.

3. Larger objects are harder to stop and start.

4. Every action there is an equal and opposite reaction.

K - 6

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5. There are the five senses.

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11. Proper use of tools for "specific task" (example: hammer, screwdriver)

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13. Proper handling of preserved specimens.

*14. Proper methods of seed planting.

15. Proper cleanup activities.

16. Proper use of microscope and telescope.

17. Use of thermometer.

18. Proper handling of living organisms.

19. Proper use of electrical equipment.

20. Proper use of indicators.

*21. Proper use of laboratory safety devices.

*22. Proper use of simple laboratory equipment.

*These skills are thought to pertain to all concepts.

PROCESS SKILLS

1. OBSERVING

2. MEASURING (to include usage in both metric and English)

   Sequence
   (a) Time
   (b) Length
   (c) Temperature
   (d) Mass
   (e) Volume
   (f) Force
   (g) Estimating

3. DEFINING

4. VARIABLES

   (a) Definitions of controlled, responding, manipulative
   (b) Use of the above variables
   (c) Recognizing

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Predicting
   (b) Interpreting
   (c) Generalizing
   (d) Graphing and table construction

9. IDENTIFYING

10. TESTING

VALUES & ATTITUDES TO BE DEVELOPED

1. Awareness
2. Respect and care for animals
3. Respect for one's self
4. Questioning of all science happenings
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Consideration of consequences
10. Proper care and respect for human body
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Consideration and respect for all learning materials
14. Demand for verification
15. Respect for logical conclusions
16. Makes a distinction between scientific evidence and personal opinion
17. Appreciation of scientific work being carried out by others
18. Respect for electricity
19. Appreciation of past accomplishments of science and famous scientists
20. Appreciation for drugs
21. Recognizing the limitations as well as the usefulness of science and technology in making the world a better place to live
22. To recognize a need for self-control and self-discipline in scientific endeavors

FIELD TRIPS - LEVEL 4

Blackwater Refuge

Cape Henlopen Park

Doctor's Office

Georgetown Substation

WBOC - Salisbury, Maryland

LEVELS 5 & 6

I. PLANT KINGDOM

1. A plant has six parts (root, stem, leaves, flower, fruit, seed).

2. Plants have several processes such as photosynthesis, pollination, germination.

3. Plants can be classified according to their characteristics (making seeds, not making seeds).

4. Many plants are poisonous.

5. The plant's role is important in ecology.

II. ANIMAL KINGDOM

1. The cell is the basic structure of all living things.

2. There are structural units of living organisms (cell, tissue, organ, system, organisms).

3. There are simple (one cell) and complex animals.

4. In nature there are simple food chains.

5. Vertebrates and invertebrates have major characteristic differences.

6. Some animals have become extinct.

7. The human body has many functions.

III. HEALTH AND NUTRITION

1. Personal and dental hygiene is important.

2. Good nutritional habits are important.

3. There are many local sources of pollution.

4. Essential nutrients (vitamins, minerals, fats, carbohydrates, protein, etc.) are very important to our health.

IV. DRUGS

1. Society's use of drugs is complex.

2. There can be many dangers involved in the use of drugs.

3. Some drugs have made valuable contributions to our society.

4. Drugs can be classified.

5. Some drugs affect the central nervous system.

V. ATOMS AND MOLECULES

1. An atom is different from a molecule.

2. There are several parts of an atom.

3. It is important to know some chemical terminology (element, compound, and mixture).

4. Simple chemical experiments illustrate many important concepts (example: difference between acids and bases).

VI. EARTH AND SPACE

GEOLOGY

1. The earth is divided into different layers.
2. Forces changing the earth are constructive and destructive.
3. The rock cycle distinguishes between the three types of rocks.
4. Minerals are found in the earth.
5. Conservation of the earth is important.

VI. EARTH AND SPACE (CONT'D).

ASTRONOMY

1. The earth's atmosphere is divided into different layers.

2. Knowledge of the telescope and its use is important.

3. There are nine planets and they have a relationship to the sun.

4. A mock space travel situation to the moon is a valuable experience.

VII. WEATHER

1. The earth tilts on its axis.

2. Air pressure affects changes in the weather.

3. There are various weather devices (barometer, anemometer, wind vane).

4. There are different kinds of clouds and they predict weather changes.

5. Water goes through a cycle.

6. Major winds have different causes.

7. Various terminologies are connected with weather forecasting.

VIII. ELECTRICITY

1. There are simple electric circuits.
2. There are differences between conductor and insulator.
3. Electricity can be produced by magnets, generators, chemicals, and electric motors.
4. Electricity has many uses.

IX. SIMPLE MACHINES

1. It is important to know some mechanical terminology (work, effort, energy, resistance, force, weight, efficient, distance, mechanical, output, and input).

2. Six types of simple machines can be easily constructed.

3. A complex machine is made of many simple machines.

X. GENERAL

1. The concept of the population explosion is important in ecology.

2. The metric system should become familiar.

3. The microscope is a valuable scientific instrument.

4. Some experiments show "variables" and "controls".

5. There is a scientific method of thinking.

K - 6

GENERAL

1. A point or line graph tells date.

2. The metric system is a form of measuring.

3. Objects can be ordered according to shapes, colors, size, volume, and number.

4. The terms "up", "down", "over", "under", "left", "right", "forward", "backward" can be used to locate objects.

5. There are the five senses.

6. Time is measured in various ways.

7. A simple balance can help ordering objects by weight.

8. There are differences between observations and inferences (comparing what you see to what you have guessed).

PSYCHOMOTOR SKILLS

*1. Proper coordination of the senses in reaching for, grasping, holding, and releasing objects.

2. Use and awareness of five basic senses.

3. Use of linear measurement devices.

4. Use of weighing devices.

5. Proper use of weather instruments.

6. Proper use of scientific models.

7. Proper use of audio-visual equipment.

8. Proper care and use of magnets.

9. Proper use of aquarium, terrarium apparatus.

10. Proper use of graphing materials.

11. Proper use of tools for "specific task" (examples: hammer, screwdriver)

12. Proper use of simple and complex machines.

13. Proper handling of preserved specimens.

*14. Proper methods of seed planting.

15. Proper cleanup activities.

16. Proper use of microscope and telescope.

17. Use of thermometer.

18. Proper handling of living organisms.

19. Proper use of electrical equipment.

20. Proper use of indicators.

*21. Proper use of laboratory safety devices.

*22. Proper use of simple laboratory equipment.

*These skills are thought to pertain to all concepts.

PROCESS SKILLS

1. OBSERVING

2. MEASURING (to include usage in both metric and English)

   Sequence
   (a) Time
   (b) Length
   (c) Temperature
   (d) Mass
   (e) Volume
   (f) Force
   (g) Estimating

3. DEFINING

4. VARIABLES

   (a) Definitions of controlled, responding, manipulative
   (b) Use of the above variables
   (c) Recognizing

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Predicting
   (b) Interpreting
   (c) Generalizing
   (d) Graphing and table construction

9. IDENTIFYING

10. TESTING

VALUES & ATTITUDES TO BE DEVELOPED

1. Awareness
2. Respect and care for animals
3. Respect for one's self
4. Questioning of all science happenings
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Consideration of consequences
10. Proper care and respect for human body
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Consideration and respect for all learning materials
14. Demand for verification
15. Respect for logical conclusions
16. Makes a distinction between scientific evidence and personal opinion
17. Appreciation of scientific work being carried out by others
18. Respect for electricity
19. Appreciation of past accomplishments of science and famous scientists
20. Appreciation for drugs
21. Recognizing the limitations as well as the usefulness of science and technology in making the world a better place to live
22. To recognize a need for self-control and self-discipline in scientific endeavors

FIELD TRIPS - LEVELS 5 & 6

Bakery - Federalsburg, Maryland

Woods Area

Pond Area

Doctor's Office

High School Chem. Course

School Grounds

Latex Plant - Dover, Delaware

Star Gazing Party

Seaford Municipal Sewage Treatment Plant

Salisbury Airport

Delaware Power & Light (Indian River, Vienna)

Burton's Chevrolet - Seaford

LEVEL 7

I. LIVING THINGS

EVOLUTION

1. Living things are the results of a process of evolution.

2. Reproduction increased the variation among living things.

3. Organisms do not reproduce themselves exactly.

4. Adaptations are the changes an animal must make to survive in his environment.

CLASSIFICATION

1. Animals may be grouped according to structural differences, body temp., or habitat; the most common difference being structural difference.

2. Characteristics (such as immobility and ability to make food) distinguish plants from animals.

3. There is a vast number of species of protists, some beneficial, some harmful.

I. LIVING THINGS (CONT'D)

GENETICS

1. Living things transfer their characteristics to their offspring with some slight variation.

2. The modern study of heredity was begun by Gregor Mendel in the late 19th century.

3. The basic structures of heredity are the DNA molecule, the gene, and the chromosome.

4. Mutations are changes in the genetic makeup of a living thing.

REPRODUCTION & DEVELOPMENT

1. Animals and plants differ in their modes of reproduction.

2. The process of development varies among different organisms.

I. LIVING THINGS (CONT'D)

STRUCTURE

1. The living substance consists of elements and compounds which together play a vital role in body chemistry.

2. The organizational structure of animals varies greatly.

3. Plant structures vary greatly from simple plants (such as algae) to complex plants (trees).

4. Though protists are said to be the simplest animals, their one cell moves, takes in food, and does all the other things that animals can do.

5. Protists must be observed using microscopes of various types.

LIFE CYCLES

1. All living things go through life cycles.

2. Life cycles vary greatly among animals:
   (a) Insects' life cycles are of 2 types.
   (b) Organisms pass through several stages; youth, maturity, and old age.

3. Protists may be found in nearly any environment and can survive under almost any conditions.

I. LIVING THINGS (CONT'D)

ENVIRONMENTAL STUDIES

1. Environmental studies reflect man's concern for his living conditions.

2. Every living thing is surrounded by living and non-living things and is affected by these things.

3. These things (the environment) are constantly changing.

4. There are various ways of monitoring and controlling certain aspects of our environment.

5. Man must continue to avoid his already negative acts which could upset the balance of nature in the natural environment.

INTERDEPENDENCY OF LIVING THINGS

1. All animal life is dependent upon plant life, which is in turn dependent upon the sun in order to carry out photosynthesis.

2. Plants which contain no chlorophyll, such as fungi, must depend on other sources for their food.

II. MATTER & ENERGY

FORMS OF ENERGY

1. Electricity is the flow of electrons.

2. There are two kinds of electricity--static electricity and current electricity.

3. Electricity is one of the most useful forms of energy.

4. Sound is produced by vibrations and travels in waves.

5. There are many different kinds of sounds.

6. Light travels in a straight line and is affected in various ways by different objects.

7. An object may absorb or reflect any of the basic colors of the spectrum.

8. Heat is a useful form of energy.

II. MATTER & ENERGY (CONT'D)

SIMPLE MECHANICS

1. The invention of the wheel and application of other ideas of mechanics led to the development of simple machines.

2. A machine is a device which multiplies an effort through increasing a force, speeding up a force, or changing the direction of a force.

3. The six kinds of simple machines (wheel axle, lever, pulleys, inclined plane, wedge, and screw) fall into two groups (lever and inclined plane).

4. Each type of simple machine functions in a unique way toward attaining a mechanical advantage.

5. Machines are never 100% efficient, but steps can be made toward making machines more efficient.

III. GENERAL

SCIENTIFIC METHOD

1. The scientific method is a method of solving problems.

2. Experimentation or testing of one's hypotheses is an important part of the scientific method.

3. Process skills are basic to sound experimentation.

4. The successful use of the scientific method is based upon the clear statement and analysis of the problem to be solved.

GREAT NAMES IN SCIENCE

1. Man has profited from the discoveries of great scientists from the past.

2. Before gaining a complete understanding of new or modern concepts, one must understand and appreciate the old.

3. Famous scientists have a common trait of curiosity and the desire to know.

III. GENERAL (CONT'D)

LAB. PROCEDURES AND SAFETY

1. Lab. procedures are specific for each type of science that is studied.

2. Safety is the number one priority of all laboratory situations.

3. To be safe in a lab. requires a knowledge of apparatus, location of safety equipment and its usage, and all emergency procedures.

4. Lab. procedure is specific according to what type of science and what kind of problem is involved.

CAREER IN SCIENCE

1. Science is a major tool in the function of our society.

2. Careers in science involve prof. and non-prof. employment.

3. Considerations of potential careers should accompany the study of various subjects in science.

III. GENERAL (CONT'D)

MEASUREMENT SYSTEM

1. There are two popular systems of measurements (English and Metric).

2. Metric is the measurement system used by scientists.

3. Conversions from one system to the other is a necessary skill due to the popular use of both systems.

4. Reliable methods of estimation are needed when direct measurement is impractical.

5. Measurement is never truly exact.

6. Precision and accuracy are dependent upon proper measurement techniques.

7. Proper measurement technique should accompany as many science process skills as possible.

8. Proper measurement of time and temperature is necessary to successful lab. procedures.

9. Quantities in science are often expressed with the use of decimals and scientific notation.

PSYCHOMOTOR SKILLS - Level 7-8

*1. Proper coordination of the senses in reaching for, grasping, holding and releasing objects.
*2. Development of five basic senses.
3. Proper use of linear measurement devices.
4. Proper use of weighing devices.
5. Proper use of weather instruments.
6. Proper use of scientific models.
7. Proper use of audio-visual equipment.
8. Proper care and use of magnets.
9. Proper use of aquarium, terrarium apparatus.
10. Proper use of graphing materials.
11. Proper use of tools for "specific task" (Example: hammer, screwdriver)
12. Proper use of simple and complex machines.
13. Proper handling of preserved specimens.
14. Proper methods of seed planting.
*15. Proper cleanup activities.
16. Proper use of microscope and telescope (adjusting and focusing).
17. Proper use of graduated containers.
L 18. Proper use of Bunsen burner.
A 19. Proper use of thermometer.
B *20. Proper use of laboratory glassware.
21. Proper use of fire extinguisher.
O 22. Proper handling of living organism.
R 23. Proper use of electrical equipment.
I 24. Proper use of timing devices.
E 25. Proper use of chemicals.
N 26. Proper demonstration of sterile techniques.
T 27. Proper care and use of dissecting equipment.
E 28. Proper use of indicators (pH paper).
D 29. Proper use of filtration and sifting devices.
*30. Proper use of laboratory safety devices.
*31. Proper use of laboratory hardware (tongs, etc.)

*These skills are thought to pertain to all concepts.

PROCESS SKILLS 7-8

1. OBSERVING

   (a) Using 5 basic senses
   (b) Observe in quantitative terms
   (c) Observing for change

2. MEASURING (to include usage in both metric and English)

   Sequence
   (a) Time
   (b) Length
   (c) Temperature
   (d) Mass
   (e) Volume
   (f) Force
   (g) Estimating

3. DEFINING - both conceptual and operational

4. VARIABLES

   (a) Definitions of controlled, responding, manipulating
   (b) Use of the above
   (c) Recognizing

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Graphing and table construction
   (b) Predicting
   (c) Generalizing
   (d) Interpreting

9. FORMULATING HYPOTHESES

10. IDENTIFYING

11. TESTING

AFFECTIVE SKILLS - Level 7-8

1. Questioning of all science happenings
2. Makes a distinction between scientific evidence and personal opinion
3. Respect for logical conclusions
4. Demand for verification
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Considerations of consequences
10. Consideration and respect for all learning materials
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Appreciation of scientific work being carried out by others
14. Appreciation of past accomplishments of science and famous scientists
15. Recognizing the limitations as well as the usefulness of science and technology in making the world a better place to live
16. To recognize a need for self-control and self-discipline in scientific endeavors
17. Awareness of one's surroundings

NOTE: It is felt that these affective skills pertain either directly or indirectly to all concepts in levels 7-9

FIELD TRIPS - LEVEL 7

Blackwater Refuge

Bombay Hook Refuge

Smithsonian Institute, Washington, D.C.

Franklin Institute

Longwood Gardens

Local Pond Area

LEVEL 8

I. EARTH AND SPACE

EARTH

1. There are many components of earth and its atmosphere.

2. These components are in constant motion and change.

3. The earth's surface is always changing.

4. A study of rocks and fossils reveals facts concerning the early history of the earth.

5. Earthquakes, volcanoes, geysers, and hot springs are earth changing forces.

6. Erosion, weathering, running water, glacial ice, winds and waves are forces that sculpture the earth's surface.

7. Many natural resources are the results of earth's change.

8. The earth and its atmosphere are made up of 92 basic elements.

9. There are 2 basic types of maps that graphically diagram the earth's surface.

10. Geology is a study of the different types of rocks and minerals found on or near the surface of the earth.

I. EARTH AND SPACE (CONT'D)

EARTH (CONT'D)

11. Weather is the condition of the atmosphere at any given time.

12. Climate is the seasonal average of weather conditions.

13. Seasons are determined by the tilt of the earth on its axis.

14. A careful study of various weather factors is needed to make weather predictions.

15. Several types of instruments are used in predicting weather.

16. Topography affects weather and climate.

17. Our time on earth is determined by the relative position of the sun and earth.

18. The resources of our earth are limited and should be conserved.

19. The temperature of the atmosphere keeps changing.

20. The physical atmospheric conditions that affect weather are:
    a. Air temperature and convection
    b. Water vapor content
    c. Atmospheric pressure
    d. Earth's rotation

I. EARTH AND SPACE (CONT'D)

SPACE

1. Astronomy is the study of objects and the phenomena of space.

2. The solar system is composed of the sun, planets, and their moons, comets, and meteors.

3. Observatories are the laboratories that study space.

4. Space travel and space exploration have revealed and continue to reveal many new facts about space.

I. EARTH AND SPACE (CONT'D)

OCEANS

1. 3/4 of the earth's surface is covered by our oceans.

2. Oceanography is the scientific study of the oceans.

3. The oceans are the sources of all life.

4. The oceans have a far reaching effect on our lives.

5. Movements in the oceans are determined by various factors.

6. The topography of the ocean floor is varied.

7. The ocean water is comprised of many elements and compounds.

8. The citizens of our oceans show a variety of adaptations.

II. MATTER AND ENERGY

PROPERTIES OF MATTER AND ENERGY

1. The world consists of matter and energy.
2. Matter exists in 3 states, and may be living or nonliving.
3. Matter has various properties.
4. Matter is made up of molecules.
5. Matter exists as either an element, compound, or mixture.
6. In order for matter to move or do work, energy must be present.
7. There are different forms of energy which can be changed from one kind into another.
8. The total amount of the world's energy, the source of which is the sun, remains almost the same.
9. A force is a push or pull which makes objects move, or brings them to a stop.
10. Gravity is the attractive force between matter.
11. The nucleus of the atom is held together by nuclear energy.
12. Fission and fusion are processes whereby nuclear energy may be used.

II. MATTER AND ENERGY (CONT'D)

PROPERTIES OF MATTER AND ENERGY (CONT'D)

13. Some common uses for nuclear energy are power, warfare, tracers, and sterilizers.

14. Radiation is emitted from the nucleus of atoms.

15. The life of radioactive materials varies.

16. Radiation is dangerous to life.

III. GENERAL

GREAT NAMES IN SCIENCE

1. Man has profited from the discoveries of great scientists from the past.

2. Before gaining a complete understanding of new or modern concepts, one must understand and appreciate the old.

3. Famous scientists have a common trait of curiosity and the desire to know.

III. GENERAL (CONT'D)

LAB. PROCEDURES & SAFETY

1. Lab. procedures are specific for each type of science that is studied.

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III. GENERAL (CONT'D)

CAREERS IN SCIENCE

1. Science is a major tool in the function of our society.

2. Careers in science involve prof. and non-prof. employment.

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O 22. Proper handling of living organism.
R 23. Proper use of electrical equipment.
I 24. Proper use of timing devices.
E 25. Proper use of chemicals.
N 26. Proper demonstration of sterile techniques.
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   (g) Estimating

3. DEFINING - both conceptual and operational

4. VARIABLES

   (a) Definitions of controlled, responding, manipulating
   (b) Use of the above
   (c) Recognizing

5. CLASSIFYING

   (a) Grouping
   (b) Ordering

6. COMMUNICATING

7. INFERRING

8. ORGANIZING DATA

   (a) Graphing and table construction
   (b) Predicting
   (c) Generalizing
   (d) Interpreting

9. FORMULATING HYPOTHESES

10. IDENTIFYING

11. TESTING

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1. Questioning of all science happenings
2. Makes a distinction between scientific evidence and personal opinion
3. Respect for logical conclusions
4. Demand for verification
5. Respect for order in nature
6. Learning to live harmoniously with one's environment
7. Demonstrating confidence and satisfaction
8. Making responsible decisions
9. Considerations of consequences
10. Consideration and respect for all learning materials
11. Desire to search for knowledge of the nature of things
12. Desire to search for data and their meaning
13. Appreciation of scientific work being carried out by others
14. Appreciation of past accomplishments of science and famous scientists
15. Recognizing the limitations as well as the usefulness of science and technology in making the world a better place to live
16. To recognize a need for self-control and self-discipline in scientific endeavors
17. Awareness of one's surroundings

NOTE: It is felt that these affective skills pertain either directly or indirectly to all concepts in levels 7-9

FIELD TRIPS - LEVEL 8

Bower's Dig

Soil & Water Conservation - Georgetown

Chincoteague Wildlife Refuge

Smithsonian Institute - Washington, D.C.

Dover Planetarium

Marine Lab. - Lewes, Delaware